



State of Utah

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Governor

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Lieutenant Governor

## Department of Administrative Services

KIMBERLY K. HOOD  
Executive Director

### Division of Facilities Construction and Management

F. KEITH STEPAN  
Director

# ADDENDUM #1

Date: January 12, 2007

To: Contractors

From: Wayne Smith, Project Manager, DFCM

Reference: Interior/Exterior Remodel Tooele Armory  
Utah National Guard  
DFCM Project No. 06193470

Subject: **Addendum No. 1**

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***Note: This Addendum shall be included as part of the Contract Documents. Items in this Addendum apply to all drawings and specification sections whether referenced or not involving the portion of the work added, deleted, modified, or otherwise addressed in the Addendum. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.***

**1.1 SCHEDULE CHANGES – There are no schedule changes per this addendum.**

**1.2 GENERAL**

- 1.2.1 This construction project is running concurrently with a mechanical upgrade to the building which will include a new boiler, new inserts for the wall heaters in classrooms, new piping, new air handler for the drill area, and new controls. Coordination between the two projects will be necessary to prevent the work from one contractor, impeding, or delaying the work schedule of the other. Todd R. Packer Heating & Air, PH 968-2255 is the mechanical contractor for the mechanical project.
- 1.2.2 Utah Controls Inc. is the mechanical controls contractor for the mechanical upgrade and has been approved as the sole source supplier of the mechanical controls for this project, to enable the controls to be compatible.

### 1.2.3 **ON THE DRAWINGS:**

1. Sheet AS-102, Site Plan: Note that landscaping work is to include removal of existing sod, trees, shrubs, and existing sprinkler system piping before new work is to commence.
2. Sheet AE-102, Floor Plan: ALTERNATES:
  - a. **ALTERNATE #1:** Repair and finishing of a section of Drill Hall maple flooring to match existing flooring; see drawings for area included.
  - b. **ALTERNATE #2:** Repainting of existing Drill Hall Room #104 to include walls, ceiling, conduit, and ductwork; see Addendum item listed below for specification for painting.
  - c. **ALTERNATE #3:** To include finishing of the following rooms; work to include installation of new drywall over existing CMU walls, painting of all walls and ceilings, installation of new 4" rubber base, and carpeting of floors. See notes on drawing AE-102. (Room #103, Office; Room #105, Waiting; Room #106, Office; Room #107, Office; Room #108, Office/Supply; Room #109, Exercise; Room #110, Classroom; Room #111, Office; Room #112, Office.
  - d. **ALTERNATE #4:** Replace all doors #6 with new solid core oak to be finished to match existing Restroom area doors; work to include replacement of lockset, hinges, and the removal of the existing door hardware including closers. Patch and repair hollow metal frame as required before painting.
3. Sheets AE-102 and AE-104, Floor Plan and Elevations: In the new rooms #113, #114, #115, #116—remove existing ½" Celotex ceilings and install new fire taped 5/8" gypboard ceiling. Drawings call for 12" blown-in, R-38 insulation over new gypboard ceiling. Note that a new suspended acoustic tile ceiling will be suspended in these areas.
4. Sheet AE-102, Floor Plan: Room #101, Vestibule—Carry the exterior stucco on brick finish into the Vestibule on the north and south walls (approximately 7'-0" x 10'-0" each side). Note that door #5 calls for replacement along with new hollow metal frame and hardware.
5. Sheet AE-102, Floor Plan: Add to the Door Schedule the following: Provide door closers to Doors #7 and #9, which is listed as Hardware Group H-5 with the exception of no closer required for Door #5.
6. Sheet AE-103, Elevations: Note that in the areas calling for a pop-out horizontal accent band the area below the accent to the top of the foundation will be the same color as the band and all others above that will be a different color (lighter). Also note that on Details 3 and 4 on this sheet the stainless steel mesh referred to is to be changed to stainless steel chicken wire type anchored to brick. Where stucco is to be over new wood framing, install "Tyvek" moisture barrier before installation of chicken wire and stucco.
7. Sheet M-1.01, Mechanical Details, Specifications, Schedules, and Notes: We call your attention to a note at the bottom of the Automatic Temperature Control Specification shown in the middle of the sheet which reads

"controls for this addition shall be 'Utah Controls' and shall match and be integrated with the new control system for the new boiler which is under separate contract.

### **IN THE SPECIFICATIONS:**

1. DFCM General Conditions: Note Contractor is to be familiar with State requirements listed in this section of the Specifications.
2. Bid Proposal: Note Contractor is to provide Alternate costs for Alternates 1 through 4 listed above.
3. Section 07240, Standard Stucco System:
  - a. Paragraph 2.02, Materials, A. Change "Tyvek" stucco vapor barrier called for is to be used in those new areas where wood framing is called for; see elevations in plan..
  - b. Paragraph 2.02, Materials, B. Change the base coat reinforcement from stainless steel mesh to stainless chicken wire anchored to brick and wood sheathing.
  - c. Paragraph 2.02, Materials, C. Where the new stucco abuts the existing concrete bond beams, use a galvanized metal edge trim with attached expanded metal edging (to be painted and caulked to the concrete beam).

4. Section 08712, Door Hardware, (and on drawings): Change the door lockset manufacturer to "Best" and note that cylinders are to accommodate the existing National Guard standard cores.
5. Section 09900, Painting, Paragraph 3.09, Schedule, E: Add new item E—All existing walls and ceiling surfaces calling to be painted in the Finish Schedule are to receive two (2) coats of acrylic enamel, semi-gloss. Note any necessary repairs and patching are to be done prior to painting. Existing painted steel beams, columns, metal roof deck, and hollow metal doors and frames are to be repainted with two (2) coats of alkyd enamel.
6. Section 16110, Communications Horizontal Cabling: New specification section added relative to telephone communication work to be done as a part of this project. Note that this communications work will need to be bid and provided by an approved Siemons Contractor:
  - a. Americom Technology
  - b. Cache Valley Electric
  - c. Federal Communications Group
  - d. Lumix Communications
  - e. Niels Fugal & Sons Company

Provide four (4) additional communication receptacles complete with junction box and 1" conduit to be run from junction box back to Office #112 to central communications panel. These new communication receptacles are to be located on the long walls both east and west sides of Rooms #114 and #115 (centered) next to shown power outlets, space communications receptacle minimum of 12" apart from power outlet. Also, note that the conduit called from the communications receptacles shown on the original drawings are to be changed to a 1" conduit that will accept a CAT 6 cable. The approved Siemon's contractor is to include in his bid and this bid the cost for the cabling and the necessary hardware to provide an approved Siemons application for addition to the original system.

7. This Addendum is to be considered a part of the Construction Documents. Also, note that the bids for this project are to be received and opened at the temporary DFCM office located at the Fair Park; see Project Schedule for location.

## **1.2.4 SECTION 16110 - COMMUNICATIONS HORIZONTAL CABLING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

A. Drawings and general provisions of the Contract, including General and Supplementary

Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

A. This Section includes wire, cable, connecting devices, patch cords, racks, installation, wire management, and testing for wiring systems to be used as signal pathways for voice and highspeed data transmission.

#### **1.3 DEFINITIONS**

- A. EMI: Electromagnetic interference.
- B. IDC: Insulation displacement connector.
- C. LAN: Local area network.
- D. PLENUM CABLE: Listed for use in air-handling spaces.
- E. PVC: Polyvinyl chloride.
- F. UTP: Unshielded twisted pair.

#### **1.4 SUBMITTALS**

A. General: Include data pertaining appurtenances and accessories:

1. Comply with Division 1 section "Submittals". Include minimum of ten (10) 3-ring binders.
2. Properly mark specific service or function, and intended location of use within project (i.e., voice BDC and IDC termination).

3. Clearly identify or highlight to indicate applicable items.
  4. Properly mark with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.
- B. Product Data: Include data on features, ratings, and performance for each component specified, including but not limited to:
1. Each type of cable.
  2. Each type of cable connector.
  3. Each type of patch panel.
  4. Each type of wire management.
  5. Complete outlet assembly including frame, jacks, and cover plate.
  6. Each type of identification label.
- C. Shop Drawings: Include dimensioned plan and elevation views of each individual component. Show equipment assemblies, method of field assembly, workspace requirements, and access for cable connections.

#### COMMUNICATIONS HORIZONTAL CABLING 16110 - 2

1. System labeling schedules, including electronic copy of labeling schedules, as specified in Part 3, in software and format selected by Owner.
2. Wiring diagrams. Show typical wiring schematics including the following:
  - a. Workstation outlets, jacks, and jack assemblies.
  - b. Patch cords.
  - c. Patch panels.
  - d. Fiber-optic boxes.
- D. Cable Administration Drawings: As specified in Part 3.
- E. Samples: For workstation outlets, jacks, jack assemblies, and faceplates for color selection and evaluation of technical features.
- F. Product Certificates: For each type of cable, connector, and terminal equipment, signed by product manufacturer.
  1. Certify that the cables are suitable for the connected equipment.
  2. UL labeled and/or listed.
  3. Clearly identify transmission parameters specified (reference category 5 or higher rating).
- G. Manufacturer Seismic Qualification Certification: Submit certification that distribution racks and their components will withstand seismic forces. Include the following:
  1. Basis for Certification: Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based. Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity of each rackmounted component and of each assembled rack type, and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- H. Qualification Data:

1. Installer must show proof of current certification of the Siemon Cabling System via an

updated card given after attending the five day recertification classes.

2. Installer must be trained and certified in fiber optic cabling, splicing, termination and

testing techniques. Must have experience using a light meter and OTDR

3. Must be trained in the installation of pathways and support for housing horizontal and

backbone cabling.

I. Provide list of test equipment to be used including documentation

indicating that the proposed

equipment is capable of performing all of the tests required.

J. Field quality-control test reports.

K. Operation and Maintenance Data: For voice and data communication cabling to include in

emergency, operation, and maintenance manuals.

### 1.5 QUALITY ASSURANCE

A. The Utah National Guard (UTNG) desires to have Telecommunication parts installed in

accordance with Industry Standard TIA/568B. All projects must be coordinated and approved

through the UTNG State Telecommunications Manager (Mike Hansen, 801-523-4118) to

#### COMMUNICATIONS HORIZONTAL CABLING 16110 - 3

ensure that industry standards are adhered to. All telecommunication work to be done on any

Utah Army National Guard Facility will be coordinated and approved through Mike Hansen

(pager # (801) 249-3838) or Toby Adamson (pager # (801) 241-9942). Layout for telecommunication closets will be as followed. There will be 1 or more sheets of ¾ inch

plywood placed on the wall of the telecommunication closet. From left to right the positioning

of the metal backboards will be Green, Blue, and Yellow. You will leave proper space between

the blue and yellow boards to accommodate future growth. Along the bottoms of each of the

backboards you will install full spool boards. On the Green backboard you will install the

copper feeds for the building. The copper feeds will be terminated to lighting protection and

then to the Siemon 24 port patch panel. On the Blue backboard, the Blue Commscope CAT 5E

55N4R BL\*\*\*, will be terminated to the Siemon HD5-89D-12 \*\*\* patch panel. On the Yellow

backboard, the Yellow Commscope CAT 5E 55N4R YL\*\*\*, will be terminated to the Siemon

HD5-89D-12 \*\*\* patch panel. There will be one blue and one yellow CAT 5 or CAT 6 wire

pulled to each location. They will correlate with the same number on the patch panel (ex. Jack

101 will have one blue and one yellow wire that will be in the same location on the patch

panel.). Fiber will be terminated in an LIU can. Termination of fiber will be either ST or SC.

This will depend on location. You will need to speak with Mike or Toby in

order to know what  
facility has what termination.

\*\* This equipment is being used in the Draper facility

\*\*\* There are some Facilities that have CAT 6 horizontal cable. You will have  
to speak with Mike or

Toby in order to know what is required at each Facility.

B. Installer Qualifications: System installer must have on staff a registered  
communication

distribution designer certified by Building Industry Consulting Service  
International.

1. Factory Certification: Perform installation with factory trained and  
certified technicians by

the manufacturers of the cabling system to be installed.

2. Pre-approved Installers: Subject to compliance with contract documents,  
installers

approved for this project are as follows:

a. Americom Technology.

b. Cache Valley Electric

c. Federal Communications Group.

d. Lumix Communications

e. Niels Fugal & Sons Company.

C. Source Limitations: Obtain generic type of products through one source  
from a single

manufacturer, except for the following:

1. Wire Management.

D. Electrical Components, Devices, and Accessories: Listed and labeled as  
defined in NFPA 70,

Article 100, by a testing agency acceptable to authorities having  
jurisdiction, and marked for  
intended use.

E. Comply with NFPA 70.

F. Comply with FCC Part 68, Chapter 1, "US Code of Federal Regulations,  
"Title 47 for all

telephone system wire and cable connection components.

G. Comply with latest EIA/TIA, UL, IEEE, and ICEA standards for structured  
cabling products and  
installation.

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1. "Commercial Building Wiring Standard:" EIA/TIA 568.

2. "Commercial Building Standard for Telecommunications Pathways and Spaces:"  
EIA/TIA  
569.

3. "Color Marking of Thermoplastic Wire:" EIA-230.

4. "Commercial Building Telecommunications Wiring Standards": TSB 40.

5. "Performance Specifications for Field Testing of Unshielded Twisted Pair  
Cabling

Systems": TSB 67.

6. Standards pertaining to optical-fiber cable and system component  
construction and

installation: EIA-440, -455, -458, -475, and -509.

7. Certified type PCC FT4 FT6 for plenum cable.

8. ICEA S80-576.

9. UL Subject 444

1.6 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling  
with Owner's

telecommunications and LAN equipment suppliers. Coordinate service entrance arrangement

with local exchange carrier.

1. All work must be coordinated thru the UTNG State Telecommunications Manager (Mike

Hansen, pager 801-249-3838) to ensure that industry standards are followed.

2. Meet jointly with telecommunications and LAN equipment suppliers, local exchange

carrier representatives, and Owner to exchange information and agree on details of

equipment arrangements and installation interfaces.

3. Record agreements reached in meetings and distribute to other participants.

4. Adjust arrangements and locations of distribution frames and cross-connect and patch

panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

#### 1.7 WARRANTY

A. Special Project Warranty: Manufacturer's standard form in which manufacturer of structured

cabling system and the principal installer agree to replace and install structured cabling

components that fail in materials or workmanship, or do not meet manufacturer's official

published specifications and performance criteria within the Special Project Warranty Period

specified below. This includes labor and materials. This warranty shall be in addition to, and

not a limitation of, other rights and remedies the Owner may have against the Contractor under

the Contract Documents.

1. Warranty Period: 20 years minimum from date of Substantial Completion.

#### 1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged

with protective covering for storage and identified with labels describing contents.

1. Cable: 500 feet (76 m) of each size and type used for Project. Furnish on reels.

2. Outlet Assemblies: One of each type for every 25 installed, but no fewer than one.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

#### COMMUNICATIONS HORIZONTAL CABLING 16110 - 5

1. Cable:

a. Commscope.

2. Terminal and Connector Components:

a. The Siemon Company.

3. Distribution Racks and Wire Management:

a. The Siemon Company.

#### 2.2 EQUIPMENT/CABLING LIST

A. Equip the system with items identified in the Equipment/Cabling List. Do not construe this list

as a "bill of materials". This list identifies items of significance used during the design of the cabling installation. Where the items indicated are one portion of an assembly, provided entire assembly unless specified otherwise.

1. Siemon HD5-89D-12 Patch Panels.
2. Siemon HD6-89D-12 Patch Panels. \*\*\*
3. Siemon S210MB2-192 \*\*
4. Siemon S188-300 Vertical Wire Management \*\*
5. Siemon S188WD Horizontal Wire Management \*\*
6. Siemon S110M-WM-300 Vertical Wire Management \*\*
7. Siemon S210MB2-300 \*\*
8. Siemon S210C-4 \*\*
9. Siemon CT-5-C5-02 Angled Jack.
10. Siemon CT-C6-C6-02 Angled Jack. \*\*\*
11. Siemon CT2-FP-02 Faceplate.
12. Siemon CT MuTOA CT-MMO-02
13. Siemon SPB-V1 24 Port Patch Panel.
14. Commscope CAT 5E Blue 55N4R BL
15. Commscope CAT 5E Yellow 55N4R YL
16. Commscope CAT 6 Blue 75N4 BL \*\*\*
17. Commscope CAT 6 Yellow 75N4 YL\*\*\*
18. Green Backboard Metal M183 B2 (VAR)
19. Blue Backboards Metal M183 B1 (VAR)
20. Yellow Backboards Metal M183 B5 (VAR)
21. Full Spool boards. M187 B1 (VAR)
22. Marconi R66P25QC Lighting Protection Panel.
23. Marconi R66P50QC Lighting Protection Panel.
24. Marconi R66P100QC Lighting Protection Panel.
25. SECOR WIC 012 LIU can.
26. Siemon Rack Mount LIU FCP3-Rack. \*\*
27. Gas Protection Fuses 104410147

MDF (Main Distribution Frame) for AGCW

Standard Equipment:

1. AVAYA 107894966 100 Pair Lighting Protection 110 termination style.
2. SECOR CCH03U 72 Strand Rack Mount LIU.

The MDF at AGCW is in building 617. To gain access to this area you will have to contact Mike Hansen

at (801) 249-3838 or Toby Adamson at (801) 241-9942. All work to be bid on or done at AGCW will

contact Mike or Toby prior to starting.

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IDF (Intermittent Distribution Frame) for AGCW

Standard Equipment:

28. Siemon HD5-89D-12 Patch Panels.
29. Siemon HD6-89D-12 Patch Panels. \*\*\*
30. Siemon CT-C5-C5-02 Angled Jack.
31. Siemon CT-C6-C6-02 Angled Jack. \*\*\*
32. Siemon CT2-FP-02 Faceplate.
33. Siemon CT MuTOA CT-MMO-02
34. Siemon SPB-V1 24 Port Patch Panel.
35. Commscope CAT 5E Blue 55N4R BL
36. Commscope CAT 5E Yellow 55N4R YL
37. Commscope CAT 6 Blue 75N4 BL \*\*\*
38. Commscope CAT 6 Yellow 75N4 YL\*\*\*
39. Green Backboard Metal M183 B2 (VAR)



- 40. Blue Backboards Metal M183 B1 (VAR)
- 41. Yellow Backboards Metal M183 B5 (VAR)
- 42. Full Spool boards. M187 B1 (VAR)
- 43. Marconi R66P25QC Lighting Protection Panel.
- 44. SECOR WIC 012 LIU can.
- 45. Gas Protection Fuses 104410147

## 2.3 SYSTEM REQUIREMENTS

- A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.
- B. Expansion Capability: Unless otherwise indicated, provide positions in cross-connect, patch panels, and mounting space on each backboard or in each rack to accommodate 20 percent future increase in outlets of each type.
- C. Equipment Capability: Unless otherwise indicated, provide 100% of patch panel and wire management space in each rack for owner furnished equipment.

## 2.4 MOUNTING ELEMENTS

- A. Raceways and Boxes: Comply with Division 26 Section "Raceways and Boxes for Electrical Systems."
- B. Backboards: 3/4-inch (19-mm), interior-grade, painted fire-retardant-treated plywood floor.
- C. Distribution Racks: Modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.

## 2.5 IDENTIFICATION PRODUCTS

- A. Comply with Division 26 Section "Identification for Electrical Systems" and the following:
  - 1. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

#### COMMUNICATIONS HORIZONTAL CABLING 16110 - 7

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

- 1. Refer to Division 26 drawings for additional locations of outlets, communication rooms, and cable trays.
- 2. Provide inner duct for all fiber optic cables installed in cable tray, loose, or in conduit with diameters in excess of 1.5 inches.

### 3.2 APPLICATION OF MEDIA

- A. Horizontal Cable for Data Service: Refer to drawings for cable for runs between wiring closets and workstation outlets.
- B. Horizontal Cable for Voice Service: Refer to drawings for cable for runs between wiring closets and workstation outlets.

### 3.3 INSTALLATION

A. Wiring Method: Install wiring in raceway and cable management systems except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

1. Where raceways are not provided, install cabling in accessible ceilings, minimum 18" above suspended ceiling. Support cable a minimum of every 30" from the building structure. Do not support cable from suspended ceilings. Install cables above accessible ceilings in common areas and corridors to the furthest possible point for convenient access.

B. Install cables using techniques, practices, and methods that are consistent with Category rating of the cable installed and that ensure the performance of the completed and linked signal paths, end to end, of the category rating indicated.

C. Install cables without damaging conductors, shield, or jacket.

D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.

E. Pull cables without exceeding cable manufacturer's recommended pulling tensions.

1. Pull cables simultaneously if more than one is being installed in same raceway.

2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.

3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.

F. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.

G. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

H. Wiring within Wiring Closets and Enclosures: Provide conductors of adequate length. Train conductors to terminal points with no excess. Use wire distribution spools at points where

#### COMMUNICATIONS HORIZONTAL CABLING 16110 - 8

cables are fanned or conductors turned. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer. Connect conductors that are terminated, spliced, or interrupted to terminal

blocks. Label each terminal with designations approved by the Owner. Install wiring on racks

and at wall mounted connection blocks through wire management devices.

I. Separation of Wires: Comply with TIA/EIA-569-B rules for separating

unshielded copper voice

and data communication cabling from potential EMI sources, including electrical power lines and equipment.

1. Do not install structured cabling within 12" of power and lighting wiring, or within 12" of a fluorescent lighting and electrical fixtures.

J. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

K. Use splice and tap connectors compatible with media types.

L. Riser Cables: Install all riser cables through 5" sleeves. Support riser cable through sleeves at a minimum of even floor number intervals. Select support system based on site conditions and weight of cable.

### 3.4 GROUNDING

A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Ground and bond all equipment racks and wall fields. Provide grounding connections for cable and other system components as required by manufacturer's written instructions and TIA/EIA

607, "Grounding and Bonding of Telecommunications Systems".

1. Terminate all ground conductors to ground terminals or ground buses in equipment rooms and wiring closets.

2. Conductors: #6 AWG, THWN, Copper, color coded green.

C. Signal Ground Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.

D. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.

E. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

### 3.5 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

A. Install plywood backboards on walls of equipment rooms and wiring closets from floor to ceiling.

B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.

C. Group connecting hardware for cables into separate logical fields.

D. Use patch panels to terminate cables entering the space, unless otherwise indicated.

### 3.6 INSTALLATION STANDARDS

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A. Comply with requirements in TIA/EIA-568-B and TIA/EIA-569-B

### 3.7 IDENTIFICATION

A. In addition to requirements in this Article, comply with applicable requirements in Division 26

Section "Identification for Electrical Systems" and TIA/EIA-606-A.

B. System: Use a unique, three-syllable, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical

and systematic designations for facility's architectural arrangement.

1. First syllable identifies and locates equipment room or wiring closet where cables originate.

2. Second syllable identifies and locates cross-connect- or patch-panel field in which cables terminate.

3. Third syllable designates type of media (copper or fiber) and position occupied by cable pairs or fibers in field.

C. Workstation: Label cables within outlet boxes.

D. Distribution Racks and Frames: Label each unit and field within that unit.

E. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and

each discrete unit of cable-terminating and connecting hardware. Where similar jacks and

plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Cables, General: Label each cable within 4 inches (100 mm) of each termination and tap,

where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

G. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals

not exceeding 15 feet (4.5 m).

H. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List

incoming and outgoing cables and their designations, origins, and destinations. Protect with

rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive

schedules for Project, in software and format selected by Owner.

1. Provide cable records on an automated dBase or Excel compatible program.

Establish

fields for recording of active and inactive cable pairs to be input by Owner's personnel at

a later date. Correlate WSI number, distribution cable number, punch down block or

frame assignments, conduit or duct path and station location. Update record as the

project progresses to reflect required changes.

I. Cable Administration Drawings: Show building floor plans with cable administration point

labeling. Identify labeling convention and show labels for telecommunications closets, terminal

hardware and positions, horizontal cables, work areas and workstation terminal positions,

grounding buses and pathways, and equipment grounding conductors. Follow convention of

TIA/EIA-606. Furnish electronic record of all drawings, in software and format selected by

Owner.

1. Drawing Format: AutoCAD 2000.

3.8 FIELD QUALITY CONTROL

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A. Perform testing as required for Siemon 20 year warranty and provide reports to owner personnel.

### 3.9 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets. Refer to Division 1 Section "Closeout Procedures."

1. Include a description of the systems, a tour of the facilities, and a tutorial on using the cable testers and documentation software.
2. Include sufficient level of training to the Owner's staff to allow for installation and maintenance to be carried out to the manufacturer's specifications.
3. Subsequent to hookups of telephone/data distribution systems, operate control/signal systems to demonstrate proper functioning. Replace malfunctioning media with new materials, and then retest until satisfactory performance is achieved.
4. Documentation: Use the above time domain reflectometer to make a strip chart recording of transmission characteristics, wave form, and performance of all segments of the installation at the time of commissioning. Also, use an optical loss test set (OLTS) to measure the optical transmission loss on each optical fiber path in the system. Record loss data in a form with provision for at least 50 additional loss data entries during future maintenance operations. Bind the recordings in a cable record book indexed for easy reference during future maintenance operations and turn book over to the Owner's authorized representative.

END OF SECTION 16110

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SECTION 16120 - CONDUCTORS AND CABLES

PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field Quality-Control Test Reports: From Contractor.

#### 1.4 QUALITY ASSURANCE

A. Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7

or a member

company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 CONDUCTORS AND CABLES

A. Manufacturers:

1. Copper Wire and Cables:

- a. Alcan Aluminum Corporation; Alcan Cable Div.
- b. American Insulated Wire Corp.; a Leviton Company.
- c. General Cable Corporation.
- d. Senator Wire & Cable Company.
- e. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

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C. Conductor Insulation Types: Type THWN-2 complying with NEMA WC 5 .

D. Multiconductor Cable: Metal-clad cable (Type MC), with ground wire.

### 2.3 CONNECTORS AND SPLICES

A. Manufacturers:

- 1. AFC Cable Systems, Inc.
- 2. AMP Incorporated/Tyco International.
- 3. Burndy.
- 4. Hubbell/Anderson.
- 5. IlSCO.
- 6. O-Z/Gedney; EGS Electrical Group LLC.
- 7. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THWN-2, single conductors in raceway. Exposed Branch Circuits, including in

Crawlspaces: Type THWN-

2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THWN-2, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type THWN-2, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

J. Fire Alarm Circuits:

1. Type THWN-2 in raceway for fire alarm power circuits, for horn circuits, and for strobe circuits.

K. Emergency circuits: Install in separate raceways from all other wiring, except where they connect to the same equipment for two-source operation.

L. Class 1 Control Circuits: Type THWN-2, in raceway.

M. Class 2 Control Circuits: Type THWN-2, in raceway.

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N. Fixture Conductors: Install conductors in lighting fixtures with insulation ratings as recommended by the manufacturer's written instructions or a minimum 90 degrees C., whichever is higher.

O. Communication Conductors: Install communication conductors in raceway.

### 3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Multi-wire branch circuits: install no more than three circuits in a raceway, unless specifically shown otherwise. Install #10 conductors for branch circuits for which the distance from panelboard to furthest outlet is more than 100' for 120 volt or more than 140' for 277 volt circuits.

C. GFI circuit breakers or feed-thru outlets to outlets served: provide separate neutrals.

D. Panelboards, switchboards, MCCs, switchgear: Do not route conductors through a section which terminate in another section, except for interconnecting control conductors.

E. Remove existing conductors from raceway before pulling in new wires and cables.

F. Parallel conductors: Where parallel conductors are installed in parallel raceways, install in each raceway conductors of phase, neutral and/or ground as specified. Carefully cut parallel conductors to identical length for each phase leg. Do not parallel conductors less than #1/0.

G. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's

recommended

maximum pulling tensions and sidewall pressure values.

H. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

I. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

J. Do not install wiring through any part of a transformer vault or elevator equipment room and shaft that does not serve equipment in the respective room. Also, coordinate that piping or other items foreign to the transformer vault, elevator equipment room or shaft is not installed in these spaces.

K. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."

L. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

M. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

### 3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torqueting values. If manufacturer's torque values are not indicated, use those specified in

UL 486A and UL 486B.

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B. Conductor splices: Minimize conductor splices. Do not install in conduit bodies.

C. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors. Install compression type connectors for aluminum conductors or copper pigtail adapters for installation in mechanical lugs.

D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

E. Furniture connections: connect systems furniture to power supply circuits per manufacturer's written instructions.

F. Panelboard connections: do not splice conductors in panelboards.

### 3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized,

test for compliance with requirements.

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS,



Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve

**End of Addendum #1**